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The challenge of using routinely collected data to compare hospital admission rates by ethnic group: a demonstration project in Scotland

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ABSTRACT

Background

Recording patients' ethnic group supports efforts to achieve equity in health care provision. Before the Equality Act (2010), recording ethnic group at hospital admission was poor in Scotland but has improved subsequently. We describe the first analysis of the utility of such data nationally for monitoring ethnic variation.

Methods

We analysed all in-patient or day case hospital admissions in 2013. We imputed missing data using the most recent ethnic group recorded for a patient from 2009-2015. For episodes lacking an ethnic code we attributed known ethnic codes proportionately. Using the 2011 Census population, we calculated rates and rate ratios for all-cause admissions and ischaemic heart diseases (IHD) directly standardised for age.

Results

Imputation reduced missing ethnic group codes from 24% to 15%, and proportionate redistribution to zero. While some rates for both all-cause and IHD admissions appeared plausible, unexpectedly low or high rates were observed for several ethnic groups particularly among White groups and newly coded groups.

Conclusions

Completeness of ethnicity recoding on hospital admission records has improved markedly since 2010. However the validity of admission rates based on these data

is variable across ethnic groups and further improvements are required to support monitoring of inequality.

INTRODUCTION

The quest for equity in health and health-care in modern, multicultural societies requires accurate, recent, quantitative information on similarities and differences in health status and health care utilisation by important characteristics including ethnicity (1-3). A practical way to achieve this for ethnicity is by including an ethnic group code in individual health records. In 1991, the Department of Health recommended that general practitioners in England should include patients' ethnic group in letters referring them to hospital, but without clear guidance on how to do so (4). After this approach failed, mandatory recording in secondary care was implemented in England in 1995, backed up by detailed guidance (5). By 2005, recording ethnic group was recommended but not mandatory in secondary care in Scotland (6,7). Perhaps because of this, ethnicity was only 42% complete for hospital admissions in 2010, with four of the 15 Scottish health Boards achieving less than 10% (8). The Equality Act 2010 made an explicit legal requirement of the NHS across the UK to monitor equity and equality (9). In the light of the Act, senior NHS managers in Scotland prioritised the recording of ethnic group. Rates for hospital admissions rose rapidly to 75% in 2012, reaching 82% in 2016, and remaining at 81% in 2018 (10,11).

The Scottish Health and Ethnicity Linkage Study (SHELS) (12) linked variables from the 2001 Scotland Census including self-reported ethnic group to NHS records at an individual level, enabling comparisons to be made between the larger ethnic groups for hospital admission rates for all-causes, ischaemic heart disease and a wide range of other health conditions (13-21). Such academic research linkage projects have many strengths in terms of data accuracy and robustness, but due to the

extensive resources required, the long time lag before results become available and the need for stringent information governance covering research projects, such studies cannot provide routine ethnic monitoring as required in health policy.

Building on the efforts to improve completeness, this project aimed to investigate the utility of ethnicity recording in routine hospital admission data for monitoring equity of health care provision. Analyses based on incomplete data would be potentially biased if completeness varied between ethnic groups or if some ethnic groups were more likely to be inaccurately recorded than others. We thus initially focused on methods to maximise completeness. We produced the first analysis of hospital admission rates by ethnic group at national level, focussing on all-cause and ischaemic heart disease (IHD) admissions to permit comparisons with previous findings. While no 'gold standard' ethnicity data were available to directly assess the validity of the rates, we used published results from the SHELS cohort as a general benchmark across ethnic groups, taking account of methodological differences.

Methods

In-patients and/or day cases in Scotland in 2013 from the Scottish hospital episodes database (SMR01) formed our study population. Ethnic group codes were available in 76% of these records, with the remainder recorded as missing, unknown or patient refused. Because ethnic group may be recorded whenever a patient is admitted, different ethnic group codes could be given for the same patient. We extracted all SMR01 episodes in 2009-2015 for the patients in our 2013 study population, grouping multiple episodes and ethnic codes by patient. Imputation of an individual's ethnic code for 2013 was based on the most recent recorded ethnic group during the

period 2019-15, excluding the codes for Other Ethnic Group, Unknown or Not Provided. For the remaining patients with an Unknown or Not Provided ethnic group code after imputation, these admissions were redistributed in the same proportions as those with a known ethnic group within each five-year age band and sex category. There was thus complete ethnic group assignment across the patient cohort.

Due to small numbers and to ensure confidentiality, the two African and three Black/ Caribbean ethnic groups were each combined into one group. Pre-2011 episodes used the 2001 census ethnic groups, and therefore could not include the new 2011 codes for White Polish, White Gypsy/Traveller and Arab. Table A1 in the online supplementary information details the 2001 and 2011 census codes, the mappings between them, and the shortened text used to label the ethnic groups throughout this paper. Population data for each ethnic group were obtained from the 2011 Scottish Census. Three sets of hospitalisation admission rates were calculated and reported by sex for 2013, directly age-standardised using the 2013 European Standard Population structure (22). These were for the original recorded patient ethnicity in 2013 episodes, the imputed codes using the 2009-2015 records, and the records with complete ethnic codes following proportionate redistribution of the Unknown or Not Provided ethnic group cases (labelled as ‘original ethnic codes’, ‘imputed codes’ and ‘imputed and redistributed codes’ respectively).

Confidence intervals were calculated for directly age-standardised rates assuming a Poisson distribution (23) and rate ratios (RR) relative to the White Scottish

population produced for our 'imputed and redistributed codes' method for the full 2013 cohort.

We used International Classification of Disease (ICD10) codes I20, I21, I22, I23, I24, I25 to select all diagnoses of Ischaemic Heart Diseases. Ethics approval was unnecessary as this was an internal quality audit of the routinely-collected hospital data submitted and used by the Information Services Division of the NHS in Scotland (ISD).

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Results

Among more than 1.5 million hospital admission episodes in 2013, 76% had an ethnic group recorded. Imputation increased completeness to 85% (Table A2 online). Within ethnic groups the increase varied from 7% for White Other and Mixed groups to 26% for the Caribbean group. The number of Other Ethnic Group episodes decreased by 4% since some were replaced by more specific codes.

Figures 1 and 2 show the age-standardised all-cause hospitalisation rates per 1,000 population by ethnic group in 2013 for the three methods for males and females respectively. As expected, rates were higher after imputation and redistribution, with more episodes assigned to a known, specific code, although the observed variation and relative rankings of the ethnic groups remained similar. Very low admission rates were observed for both males and females in the White Gypsy, Arab and White Irish ethnic groups, being only 14-36% of those in White Scottish group. On the other hand, the Other Ethnic Group rates were extremely high, using all three methods.

Age-standardised rate ratios (RR) for all-cause hospital admissions are shown for the 'imputed and redistributed codes' method in Figures 3 (males) and 4 (females). For males, the highest RR was for White Other (1.88, 95% CI 1.84 – 1.93) followed by White Other British (1.39, 95% CI 1.38 – 1.41). The lowest RRs were for White Irish (0.36, 95% CI 0.34 – 0.38) followed by Chinese (0.64, 95% CI 0.59 – 0.68) and White Polish (0.78, 95% CI 0.73 – 0.83) ethnic groups. The RRs for the remaining ethnic groups ranged from 0.81 to 1.17. Very similar results were observed for the females.

Comparison with the incident rate ratios derived from the SHELS cohort (13,14) are shown in supplementary Tables A3 (all causes) and A4 (IHD). For all causes, rate ratios for both males and females were markedly lower in the current study for the White Irish and much higher for the White Other British and White Other (Table A3). The differences in the ratio ratios for the other groups were much smaller, being less than 10% for Mixed, Pakistani, Indian and Chinese males and Mixed Females. For IHD, in comparison with SHELS results, the rate ratios were markedly lower for White Irish males and females, and markedly higher for White Other British, White Other, Mixed, Pakistani and Indian males and for White Other British, White Other, Mixed and Pakistani females. Only for Chinese and Asian Other males and Indian females were the corresponding rate ratios within 10% of each other (Table A4).

The detailed data behind the 2013 rate ratios are provided in the supplementary online Tables A3 – A7.

DISCUSSION

Main findings of this study

Using routinely collected hospital admission data for Scotland in 2013, we found 76% of hospitalisation records had an ethnic group recorded. This was increased to 85% by imputation and to 100% by proportionate redistribution of the Unknown/Not Provided category. We subsequently calculated admission rates and rate ratios for 14 ethnic groups, both for all-cause hospital admissions and for IHD. There was considerable variation in admission rates among the White groups, less so among the other non-White groups. The White Irish, Arab and White Gypsy groups were implausibly low, suggesting they had been under-recorded in the Scottish hospital admission records. Apart from these, the lowest admission rates were found among the Chinese. Comparison with previously published rates based on self-reported census ethnicity suggested that, despite relatively high levels of data completeness, there was variable validity of admission rates across ethnic groups based on these routine data, particularly for IHD.

What is already known on this topic

Very few countries have included ethnic coding in their hospital admission records. In a 2009 review, Rafnsson and Bhopal found only England, Scotland and four other countries in the European Union had population or hospital admission registers with coding for migrants or ethnic minorities for cardiovascular diseases and diabetes (24). Of these, only England, Scotland, Sweden and Italy were at a national level. England and Scotland identified a number of different ethnic groups, but the rate of recording ethnic group in Scotland at that time was too low to allow any analysis. Sweden coded for country of birth and Italy for citizenship: neither specified

individual ethnic groups. Where ethnicity is routinely recorded, studies have found completeness to be sub-optimal and approaches have been proposed to maximise the usability of the data.

The English National Cancer Intelligence Network compared cancer rates in different ethnic groups by linking cancer registry and Hospital Episode Statistics (HES) datasets for 2002-2006. They found that among almost 1.2 million patients, 24% had a missing ethnic group code, and the proportion missing varied by cancer type (25). They used three different proportionality methods to assign the unknowns to ethnic groups to allow age-standardised rates to be calculated but recognised they could not exclude the possibility of bias. Three studies of cancer patients in England addressed incompleteness by assuming that the proportions of the missing values for each ethnic group were the same for those with a known ethnic group (26,27), or have focussed on rate ratios by ethnic group as in the current study (28). Another highlighted the benefits of linking patient data across multiple administrative datasets to maximise completeness (29). Aspinall and Jacobson suggested a range of approaches that might be used to address incompleteness and encourage greater use of the data (30).

While much of the literature has focussed on data completeness, few studies have been able to adequately measure and benchmark the validity and accuracy of routine ethnic data. Comparing self-reported ethnic group in a survey of over 58,000 cancer patients in England with hospital records for the same patients, Saunders et al found that in the hospital records, ethnic group was correct in 98% of White British but varied between 80% and only 10% in 15 minority groups (31). In the absence of a similar gold standard comparator, others have relied on linking records between routine datasets (29, 32) A review of ethnicity data in the health

service in New Zealand found that recording in hospitals and other health sectors was very variable (33). For example, one audit found that only 65% of Maori were correctly classified on the hospital computer system.

What this study adds

After a decision by the Scottish Government in 2009 to prioritise ethnic coding for hospital admissions and out-patient attendances, coding completeness increased rapidly from below 10% to around 75% overall and around 90% in some regions. This was achieved through focused academic, professional and managerial actions (34). However, until now the impact of these improvements on the validity and utility of the data has not been formally reviewed. In this study, we were able to improve the completeness of the data through a simple imputation method. We were also able to compare results based on hospital admission records with a reliable benchmark provided by a large scale census-based cohort (13,14). While imputation increased data completeness in this cohort from 76 to 85%, we found that considerable unexplained variation remained among some ethnic groups, particularly the White groups. Some more recently introduced ethnicity codes were still clearly under-recorded suggesting delays in full implementation. Presenting commonly used health service measures such as admission rates and rate ratios encourages more focus on the utility and value of these data, not just the completeness, and emphasises the need to improve data quality in line with other routinely collected service data.

Taken together, the previous published results and the present paper indicate that no country has yet found a way of guaranteeing accurate recording of ethnic group in

routine health data systems. This study provides a valuable evidence base to aid future improvements to ethnicity monitoring data in Scotland. Our work suggests low cost imputation and linkage methods can help increase the validity of the routine data. Census- or population register-based databases are clearly more robust but are expensive to set up and maintain and cannot provide data in real time. If policy-makers are committed to demonstrating ethnic equality in health care through monitoring, as in Scotland, then continued efforts will be needed to improve and monitor the accuracy of data recorded on administrative systems, in addition to their completeness.

Limitations of the study

This demonstration project is restricted to two outcomes for patients hospitalised in a single year. As the first analysis of such routine data for the whole of Scotland, it is open to refinement. We could have used other methods of imputing missing ethnic codes, for example the most frequently used code rather than the most recent. However, on balance, we decided the most recent was likely to be the most accurate. We assumed that all the records with unknown values after imputation were missing at random and could be assigned according to the known distribution of ethnic codes in each 5-year age group by sex. This assumption would be flawed if the records with missing values were seriously biased towards particular ethnic groups. We had no way of assessing this although comparison of demographic and other more complete admission variables did not indicate a more general bias.

We restricted imputation to a single available dataset of hospital admissions. Including additional routinely available datasets could have improved ethnicity

completeness further though this would have increased the complexity of linkage; ethnicity recording in non-hospital-based datasets remains low. Other methods of imputation could have been considered such as using geographically and demographically close donor records though this is likely to be problematic given the relatively low ethnic minority population in Scotland and others have found this to perform poorly (30, 32).

The year 2013 was chosen to benefit from the improvements in completeness of ethnicity seen in the preceding years but yet remain close to the 2011 census as the source of population denominator data for rates. However, some degree of numerator-denominator bias was still likely in the rates. We made no attempt to extrapolate the Census populations by ethnic group to provide denominators for later years in this study. While desirable, getting accurate estimates of ethnic group populations between decennial census years remains a significant challenge.

There was no gold standard benchmark for the comparison of the validity of ethnicity recording in hospital records. However we aimed to advance the debate around ethnicity monitoring by demonstrating the potential utility of the data now available through much effort in Scotland. Therefore we drew general comparison with the published results from the SHELS programme. That cohort was based on the 2001 census followed up for a number of years and thus not fully contemporaneous with the 2013 data set we used. There were some differences in statistical methods it used to calculate the standardised rates. It also did not include White Polish, White Gypsy and Arab groups, as these were only introduced from at the 2011 census. While the 2013 dataset included all ICD10 codes for IHD, SHELS only included

diagnoses of acute myocardial infarction. However, given the broad similarities of the epidemiology of different IHD diagnoses, this is unlikely to have affected the comparisons. We adjusted rates for age and sex, which vary in distribution across ethnic groups, but not for socio-economic variables. However these have been shown to have little effect on variation in admission rates among ethnic groups (13).

CONCLUSIONS

In this first national analysis of routinely collected hospital admission data analysed by ethnic group in Scotland, we have confirmed relatively high rates of ethnic group recording and demonstrated simple methods to increase the utility of the data for analytical purposes. Analysis of routine hospital records by ethnicity brings many benefits. However, the validity of admission rates based on these data is variable across ethnic groups. As in other countries, there remains the continuing challenge of achieving and sustaining high levels of accurate ethnic coding in routine health systems consistently across all ethnic groups.

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None

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Figures Legends

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Figure 2 - All-cause Hospital Admissions, Scotland, 2013; European Age-Standardised Rates per 1,000 population (females)

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Figure 4 Hospital Admissions, All causes in Scotland for All causes, 2013: European Age Standardised Rate Ratios relative to White Scottish with 95% Confidence intervals after imputation and redistribution; females

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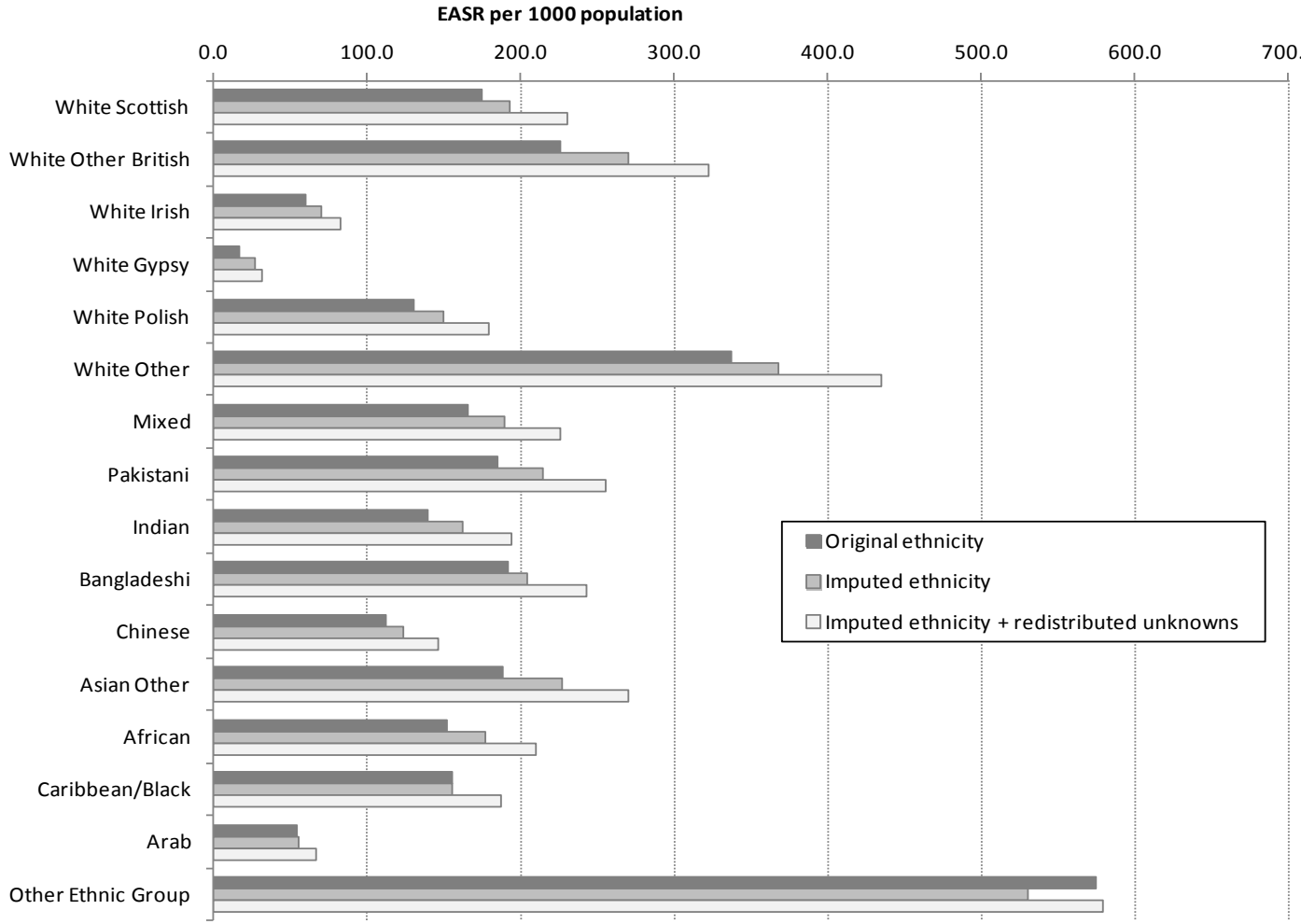

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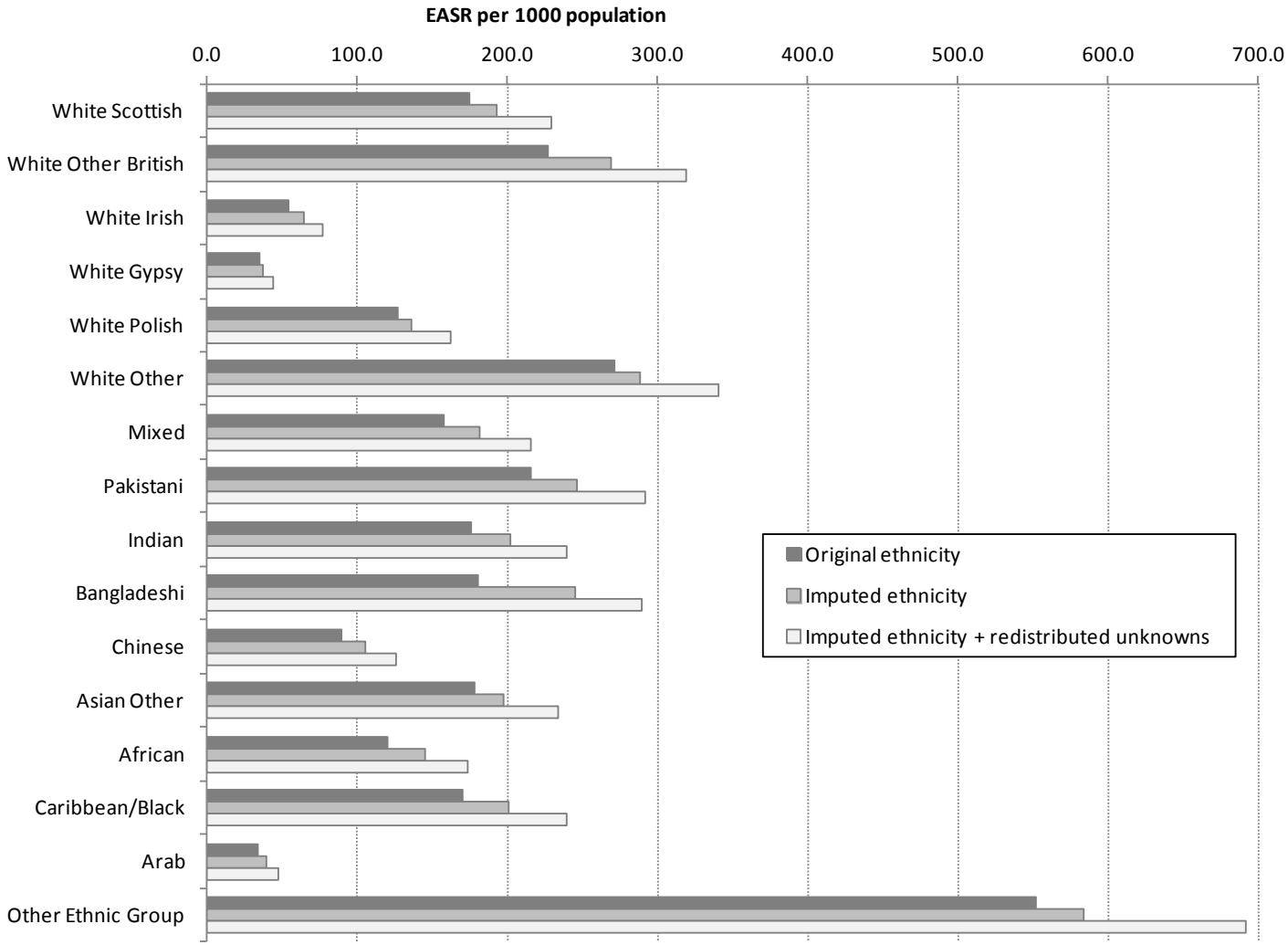

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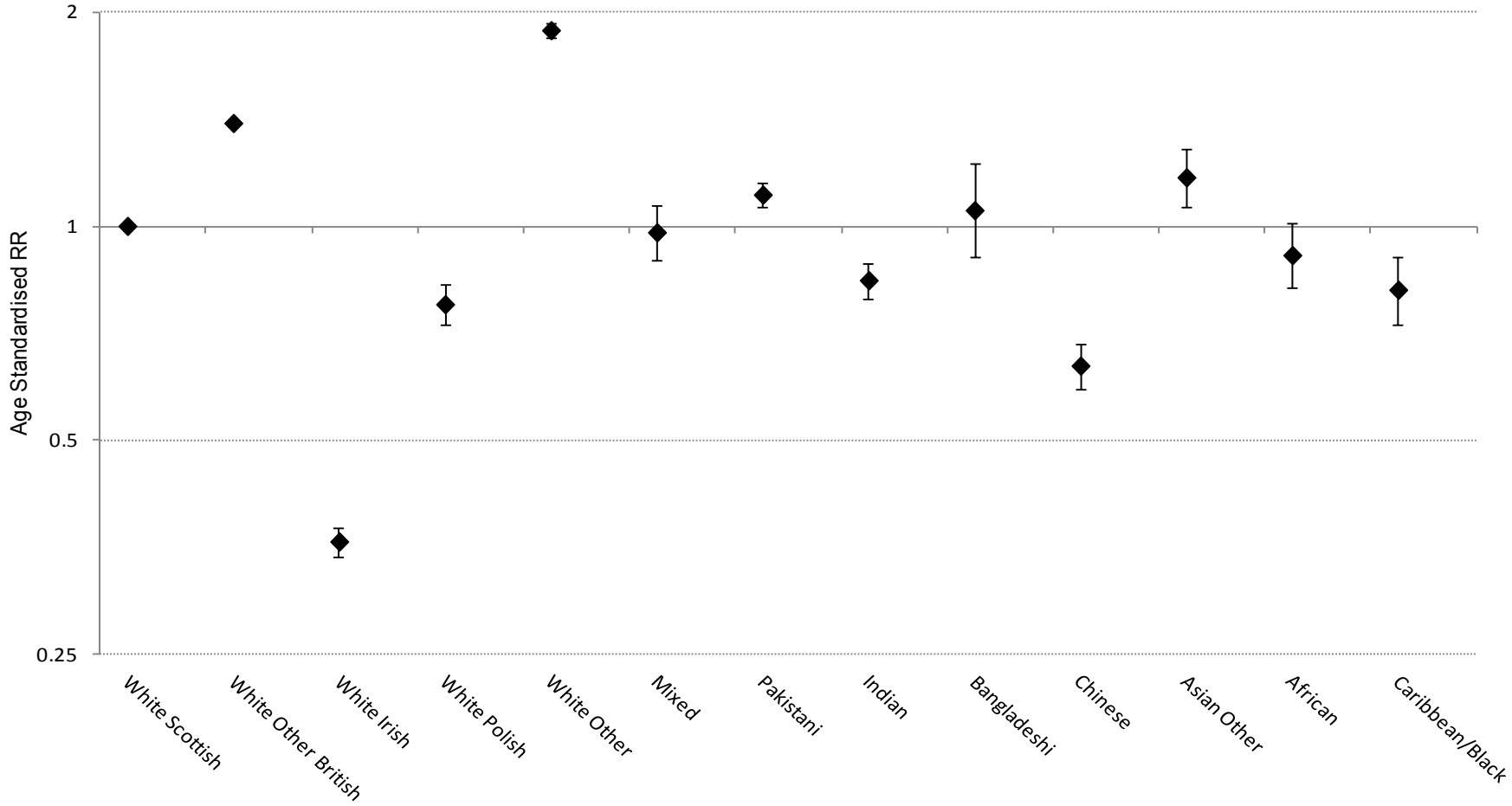

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The challenge of using routinely collected data to compare hospital admission rates by ethnic group: a demonstration project in Scotland

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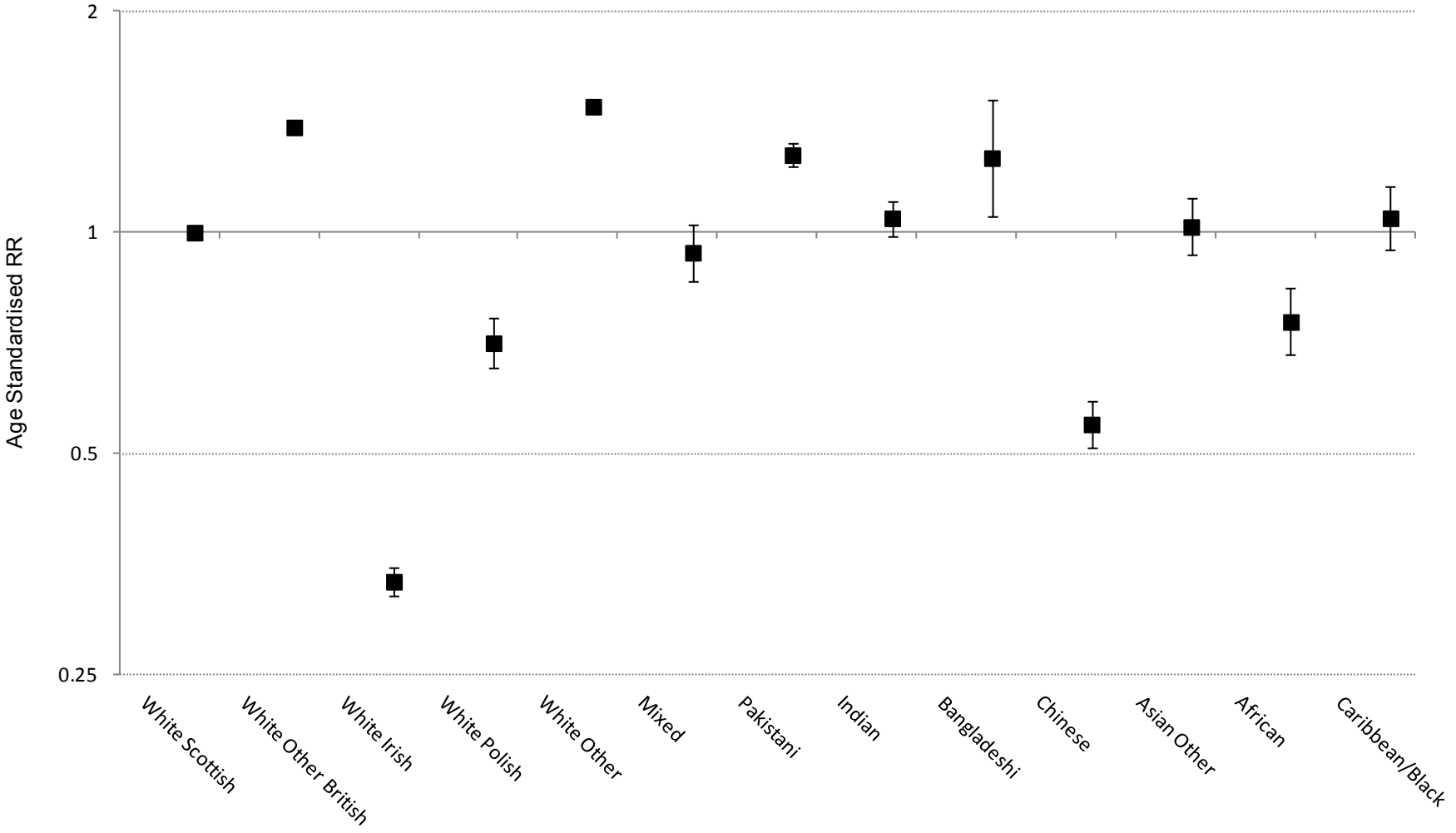

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Online supplementary data

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Table A1 – List of the codes from the 2001 Census and 2011 Census recorded in SMR01 records (along with dates they were could be used within SMR01)

2001 Census Codes (Last acceptable date is *31/03/2012)*	**Final 2011 Census Codes** *(Available from 01/10/2011)*	**Text used within publication**
A – White	***A – White***	***A – White***
1A Scottish	1A Scottish	White Scottish
1B Other British	1B Other British	White Other British
1C Irish	1C Irish	White Irish
	1K Gypsy/ Traveller	White Gypsy
	1L Polish	White Polish
1D Any other white background	1Z Other white ethnic group	White Other
B – Mixed	***B - Mixed or multiple ethnic groups***	***B - Mixed or multiple ethnic groups***
2A Any mixed background	2A Any mixed or multiple ethnic groups	Mixed
C - Asian, Asian Scottish or Asian British	***C - Asian, Asian Scottish or Asian British***	***C - Asian, Asian Scottish or Asian British***
3A Indian	3G Indian, Indian Scottish or Indian British	Indian
3B Pakistani	3F Pakistani, Pakistani Scottish or Pakistani British	Pakistani
3C Bangladeshi	3H Bangladeshi, Bangladeshi Scottish or Bangladeshi British	Bangladeshi
3D Chinese	3J Chinese, Chinese Scottish or Chinese British	Chinese
3E Any other Asian background	3Z Other Asian, Asian Scottish or Asian British	Asian Other
D - African, Caribbean or Black	***D – African***	***D – African***
4B African	4D African, African Scottish or African British	African
	4Y Other African	African Other
		(these two codes merged into one group known as African)
	E - Caribbean or Black	***E - Caribbean or Black***
4A Caribbean	5C Caribbean, Caribbean Scottish or Caribbean British	Caribbean
	5D Black, Black Scottish or Black British	Black

4C Any other black background	5Y Other Caribbean or Black	Caribbean or Black Other
		(these three codes merged into one group known as Caribbean/Black)
E - Other Ethnic Background	***F - Other ethnic group***	***F - Other ethnic group***
	6A Arab, Arab Scottish or Arab British	Arab
5A Any other ethnic background	6Z Other ethnic group	Other Ethnic Group
F - Refused/Not provided by patient	***G - Refused/Not provided by patient***	***G - Refused/Not provided by patient***
98 Refused/Not provided by patient	98 Refused/Not provided by patient	Refused/Not provided by patient
G - Not Known	***H - Not Known***	***H - Not Known***
99 Not Known	99 Not Known	Not Known

Table A2 – Impact of method of imputing ethnicity for patient episodes in 2013

	Original data	After imputation	
Ethnic Group	**No. Of episodes**	**No. Of episodes**	**Increase %**
White Scottish	982,618	1,084,589	10%
White Other British	119,311	142,545	19%
White Irish	3,998	4,758	19%
White Gypsy	107	125	17%
White Polish	5,038	5,516	9%
White Other	20,094	21,504	7%
Mixed	2,608	2,801	7%
Pakistani	8,139	9,247	14%
Indian	3,692	4,164	13%
Bangladeshi	433	497	15%
Chinese	2,200	2,459	12%
Asian Other	2,251	2,577	14%
African	2,442	2,710	11%
African Other	358	424	18%
Black	433	471	9%
Caribbean	219	277	26%
Caribbean or Black Other	447	482	8%
Arab	399	447	12%
Other Ethnic Group	2,149	2,056	-4%
Unknown\Not Provided	362,349	231,636	-36%
Total	**1,519,285**	**1,519,285**	
Percentage of Episodes with ethnicity unknown\ not provided	23.8%	15.2%	

Table A3

Comparison of rate ratios (RRs) for the current study and SHELS study (Reference 13) for All-cause admissions and the differences between them. White Scottish is the reference group for the current study (RR=1.0)

Ethnic Group		Male (RR)			Female (RR)		
Current study	**SHELS cohort**	**Current study**	**SHELS cohort***	**Difference**	**Current study**	**SHELS cohort***	**Difference**
White Scottish		1.00	1.0		1.0	1.0	
White Other British		1.40	0.81	0.59	1.39	0.85	0.54
White Irish		0.36	1.0	-0.64	0.34	0.95	-0.61
White Polish	White Other	0.78	0.81	-0.03	0.71	0.78	-0.07
White Other	White Other	1.88	0.81	1.07	1.48	0.78	0.70
Mixed		0.98	0.92	0.06	0.94	0.87	0.07
Pakistani		1.11	1.19	-0.08	1.28	1.14	0.14
Indian		0.84	0.95	-0.11	1.05	0.91	0.14
Bangladeshi		1.05	0.92	0.13	1.26	0.82	0.44
Chinese		0.64	0.62	0.02	0.55	0.66	-0.11
Asian Other		1.17	0.92	0.25	1.02	0.91	0.11
African		0.91	0.79	0.12	0.76	1.07	-0.31
Caribbean/Black	Caribbean	0.81	0.89	-0.07	1.05	1.16	-0.11
	Black	0.81	1.18	-0.27	1.05	0.86	0.19

(*) Note the rate ratios for the SHELS cohort are based on a different statistical method that means they are not directly comparable. These rates were based on poisson regression models of the risk of hospitalisation for a population-based cohort followed up from the 2001 census to 2013. The SHELS cohort use the 2001 census ethnicity groupings which differ from the 2011 census groupings used in the current study.

Table A4

Comparison of the rate ratios (RRs) for current study and SHELS study (Reference 14) analyses for Ischaemic Heart Disease (IHD) admissions and the differences between them. White Scottish is the reference group for the current study (RR=1.0)

Ethnic Group		Males (RR)			Females (RR)		
Current study	SHELS cohort	Current study	SHELS cohort*	Difference	Current study	SHELS cohort*	Difference
White Scottish		1.0	1.0	-	1.0	1.0	-
White Other British		1.3	0.77	0.53	1.32	0.72	0.6
White Irish		0.39	0.93	-0.54	0.30	0.95	-0.65
White Polish	White Other	0.81	0.82	-0.01	1.10	0.81	0.29
White Other	White Other	1.96	0.82	1.14	1.59	0.81	0.78
Mixed		1.78	1.29	0.49	1.55	1.2	0.35
Pakistani		2.4	1.42	0.98	2.5	1.29	1.21
Indian		1.45	1.21	0.24	1.16	1.24	-0.08
Bangladeshi	Asian Other	2.66	1.33	1.33	3.46	1.53	1.93
Asian Other	Asian Other	1.27	1.33	-0.06	2.04	1.53	0.51
Chinese		0.48	0.45	0.03	0.47	0.71	-0.24
African	African	1.11	1.0	0.11	0.86	1.21	-0.35
Caribbean/Black	African	0.83	1.0	-0.17	1.0	1.21	-0.21

(*) Note the rate ratios for the SHELS cohort are based on a different statistical method and disease group that means they are not directly comparable. These rates were based directly standardised rates on of the risk of Acute Myocardial Infarction (ICD codes I21, I22) for a population-based cohort followed up from the 2001 census to 2008. The reference group was the White Scottish population. The SHELS cohort use the 2001 census ethnicity groupings which differ from the 2011 census groupings used in the current study.

Table A5a: European Age-Standardised Rates (EASR) per 1,000 population after imputation and redistribution for All-cause Hospital Admissions in Scotland 2013 with 95% Confidence Intervals; males

Ethnicity	Original EASR per 1,000 Population	Imputed EASR per 1,000 Population	Imputed & redistributed EASR per 1,000 Population	Lower Confidence Limit	Upper Confidence Limit
White Scottish	175.0	193.3	230.8	230.1	231.5
White Other British	226.0	270.5	322.0	319.4	324.5
White Irish	60.2	70.0	83.2	79.4	86.9
White Gypsy	16.8	26.6	31.7	21.4	41.9
White Polish	130.3	149.8	179.2	167.2	191.1
White Other	337.4	367.7	434.7	424.7	444.7
Mixed	165.1	189.5	226.1	205.7	246.5
Pakistani	184.5	214.0	255.4	245.8	265.0
Indian	139.4	162.3	193.6	182.7	204.5
Bangladeshi	192.1	204.7	242.9	206.1	279.6
Chinese	112.7	123.6	146.9	136.3	157.4
Asian Other	188.9	227.4	270.1	245.2	295.0
African	152.1	176.7	210.0	188.2	231.8
Caribbean/Black	155.7	155.6	187.8	167.3	208.2
Arab	54.0	56.0	66.9	53.0	80.9
Other Ethnic Group	574.7	530.6	579.2	531.5	627.0

See Table A1 for mappings and shortened text

Table A5b: European Age-Standardised Rates (EASR) per 1,000 population after imputation and redistribution for All-cause Hospital Admissions in Scotland 2013 with 95% Confidence Intervals; females

Ethnicity	Original EASR per 1,000 Population	Imputed EASR per 1,000 Population	Imputed & Redistributed EASR per 1,000 Population	Lower Confidence Limit	Upper Confidence Limit
White Scottish	175.1	192.8	229.2	228.5	229.8
White Other British	227.4	268.6	318.7	316.2	321.1
White Irish	54.0	64.7	76.7	73.4	80.1
White Gypsy	35.3	37.6	44.6	32.1	57.1
White Polish	127.2	136.5	162.0	149.5	174.6
White Other	271.4	288.0	340.0	332.6	347.5
Mixed	158.1	181.1	215.2	196.3	234.0
Pakistani	215.8	246.1	292.2	281.1	303.3
Indian	176.1	202.3	239.7	226.5	252.9
Bangladeshi	180.1	244.7	289.5	237.2	341.7
Chinese	90.1	105.8	125.6	116.4	134.8
Asian Other	178.2	197.5	233.3	212.7	253.9
African	120.7	145.7	173.2	155.1	191.3
Caribbean/Black	170.5	200.9	239.7	216.5	263.0
Arab	33.4	39.9	47.6	35.9	59.4
Other Ethnic Group	552.2	583.4	691.8	636.7	747.0

See Table A1 for mappings and shortened text

Table A6a: European Age-Standardised Rate Ratios (RRs) after imputation and redistribution for All-cause Hospital Admissions in Scotland 2013 with 95% Confidence Intervals; males

Ethnicity	Rate Ratio	Lower Confidence Limit	Upper Confidence Limit
White Scottish	1.000	0.000	0.000
White Other British	1.395	1.383	1.407
White Irish	0.360	0.344	0.377
White Polish	0.776	0.726	0.830
White Other	1.884	1.841	1.928
Mixed	0.980	0.895	1.072
Pakistani	1.107	1.066	1.149
Indian	0.839	0.793	0.888
Bangladeshi	1.052	0.905	1.224
Chinese	0.636	0.592	0.684
Asian Other	1.170	1.067	1.284
African	0.910	0.820	1.009
Caribbean/Black	0.814	0.730	0.907

See Table A1 for mappings and shortened text

Table A6b: European Age-Standardised Rate Ratios (RRs) after imputation and redistribution for All-cause Hospital Admissions in Scotland 2013 with 95% Confidence Intervals; females

Ethnicity	Rate Ratio	Lower Confidence Limit	Upper Confidence Limit
White Scottish	1.000	0.000	0.000
White Other British	1.391	1.379	1.402
White Irish	0.335	0.321	0.350
White Polish	0.707	0.654	0.764
White Other	1.484	1.452	1.517
Mixed	0.939	0.860	1.025
Pakistani	1.275	1.227	1.324
Indian	1.046	0.990	1.105
Bangladeshi	1.263	1.054	1.513
Chinese	0.548	0.509	0.590
Asian Other	1.018	0.932	1.112
African	0.756	0.681	0.839
Caribbean/Black	1.046	0.949	1.153

See Table A1 for mappings and shortened text

Table A7a: European Age-Standardised Rate Ratios (RRs) after imputation and redistribution for Ischaemic Heart Disease Hospital Admissions in Scotland 2013 with 95% Confidence Intervals; males

Ethnicity	Rate Ratio	Lower Confidence Limit	Upper Confidence Limit
White Scottish	1.000	0.000	0.000
White Other British	1.296	1.260	1.334
White Irish	0.394	0.344	0.452
White Polish	0.812	0.648	1.017
White Other	1.958	1.808	2.121
Mixed	1.775	1.374	2.293
Pakistani	2.402	2.186	2.640
Indian	1.450	1.237	1.699
Bangladeshi	2.657	1.878	3.759
Chinese	0.476	0.352	0.645
Asian Other	1.274	0.925	1.755
African	1.105	0.749	1.630
Caribbean/Black	0.831	0.512	1.347

See Table A1 for mappings and shortened text

Table A7b: European Age-Standardised Rate Ratios (RRs) after imputation and redistribution for Ischaemic Heart Disease Hospital Admissions in Scotland 2013 with 95% Confidence Intervals; females

Ethnicity	Rate Ratio	Lower Confidence Limit	Upper Confidence Limit
White Scottish	1.000	0.000	0.000
White Other British	1.319	1.268	1.372
White Irish	0.301	0.246	0.370
White Polish	1.095	0.769	1.560
White Other	1.593	1.425	1.780
Mixed	1.550	1.040	2.310
Pakistani	2.501	2.150	2.910
Indian	1.161	0.879	1.534
Bangladeshi	3.464	1.851	6.483
Chinese	0.468	0.291	0.752
Asian Other	2.041	1.428	2.918
African	0.858	0.445	1.655
Caribbean/Black	0.999	0.530	1.884

See Table A1 for mappings and shortened text